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FINAL
TECHNICAL MEMORANDUM

TO:	Will Ernst, Mike Gleason (Boeing)	**DATE:**	September 6, 2005
FR:	Ted Norton (Golder)	**OUR REF:**	013-1646.002.400
RE:	Addendum to August 3, 2005 Boeing Plant 2, 2-124 Building Excavation Evaluation		

Boeing is planning construction of a new storage building, *Building 2-124*, in the parking area adjacent to Building 2-122 at Plant 2 (Figure 1). This memorandum presents the results of pre-construction soil sampling conducted within and proximal to the planned excavation areas.

Boeing intends to remove asphalt, exposing soil, and to excavate soil to accommodate foundation construction and installation of sub-grade utilities in the parking area adjacent to Building 2-122. Figure 1 shows the footprint for Building 2-124, proposed areas of excavation, and historical sample locations. None of the proposed excavation areas are adjacent to, downgradient, or within the extent of any identified RCRA units at Plant 2.

This memorandum presents analytical results for soil samples collected prior to cutting asphalt and exposing soil in the proposed construction location. Sampling was conducted to monitor health and safety and to characterize soil for disposal. Soil samples were collected at five locations (Figure 2) using a hand auger. As the excavations are unlikely to extend down to the water table, groundwater samples were not collected. Soil samples were collected as outlined in the August 3, 2005 Technical Memorandum and in general accordance with the Plant 2 *Compendium of Sampling and Analysis Plans and Quality Assurance Project Plans for Boeing Plant 2 Seattle* (Golder, 2004). No samples were collected within the boundaries of a RCRA unit.

Soil samples were analyzed for volatile organic compounds (VOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals. Table 1 presents metals results for constituents of concern (COCs). Table 2 presents VOCs (detected above reporting levels), PCBs, and TPH results for each of the soil samples. Constituent concentrations exceeding the 1999 Plant 2 PMCLs (Weston, 1999) are shaded.

Arsenic, copper, and mercury were the only COCs detected above PMCLs. Arsenic was detected (8 mg/kg) slightly above the PMCL (7.3 mg/kg) in a sample collected 3.5 feet below ground surface (bgs) at location PL2C-2124-02. Arsenic (13 mg/kg), copper (40 mg/kg) and mercury (0.12 mg/kg) were detected above PMCLs (7.3 mg/kg, 36.4 mg/kg and 0.07 mg/kg, respectively) in a sample collected from 3.6 ft bgs at location PL2C-2124-04. None of the COCs was detected above 1.8 times its respective PMCL.

References

Roy F. Weston, Inc. *Technical Memorandum Appropriateness Evaluation Corrective Measures Study Boeing Plant 2,* March 1999.

Golder Associates Inc. *Compendium of Sampling and Analysis Plans and Quality Assurance Project Plans for Boeing Plant 2 Seattle/Tukwila, Washington.* August 2004.

Golder Associates Inc. Technical Memorandum: *Boeing Plant 2, 2-124 Area Excavations Evaluation.* August 3, 2005.

cc: K. Angelos (Golder)

Attachments: Tables 1 and 2
Figures 1 and 2

TABLE 1
Summary of the 2-124 Building
Pre-Construction Soil Sample Analytical Results
Metals

Date:				8/3/2005				8/4/2005
Sample ID:				PL2C-2124-01-0045	PL2C-2124-02-0035	PL2C-2124-03-0018	PL2C-2124-05-0035	PL2C-2124-04-0036
Analyte	**Units**	**PMCL**	**2004 SL**					
Metals								
Aluminum	mg/kg	32,581	--	9,090	16,100	10,400	13,400	21,600
Antimony	mg/kg	425	464	5 U	6 U	5 U	6 U	7 U
Arsenic	mg/kg	7.3	5	5 U	8	7	7	13
Barium	mg/kg	--	93,300	23.9	57.6	37.9	48.8	69.2
Beryllium	mg/kg	0.6	222	0.1 U	0.3	0.1	0.2	0.4
Cadmium	mg/kg	1.28	1.21	0.2 U	0.3 U	0.2 U	0.2 U	0.4
Chromium	mg/kg	1,000	--	12.3	17.9	25.2	15.6	25.4
Cobalt	mg/kg	--	--	4	6.6	5.8	5	10
Copper	mg/kg	36.4	1.38	12.4	29.8	23	18.8	40
Iron	mg/kg	--	--	12,600	21,200	17,300	18,300	28,000
Lead	mg/kg	400	1,000	2 U	9	7	5	13
Magnesium	mg/kg	--	--	1,940	3,370	3,000	3,070	5,400
Manganese	mg/kg	1146	130	102	137	166	159	265
Mercury	mg/kg	0.07	0.05	0.05 U	0.06	0.04 U	0.05	0.12
Molybdenum	mg/kg	--	--	0.5 U	0.6 U	0.6	0.6 U	0.8
Nickel	mg/kg	38.2	10.7	7	14	18	11	21
Selenium	mg/kg	7.3	7.38	5 U	6 U	5 U	6 U	7 U
Silver	mg/kg	0.3	0.323	0.3 U	0.4 U	0.3 U	0.3 U	0.4 U
Thallium	mg/kg	8.9	0.669	0.1 U	0.1	0.1 U	0.1 U	0.2
Tin	mg/kg	--	--	1 U	1 U	1 U	1 U	1 U
Vanadium	mg/kg	13,000	56,100	49.5	54.5	52.4	53.4	71
Zinc	mg/kg	107	101	23.5	47.8	38.7	35.6	68.3

Notes:

-- - No applicable PMCL (Weston, 1999) or 2004 CMS Screening Level

U - Indicates that the target analyte was not detected at the reported concentration.

NA - Not applicable or not analyzed

Shading - Indicates concentration exceeds PMCL.

TABLE 2
Summary of 2-124 Building
Pre-Construction Soil Sample Analytical Results
Volatile Organic Compounds, Polychlorinated Biphenyls and Total Petroleum Hydrocarbons

Date:				8/3/2005				8/4/2005
Sample ID:				PL2C-2124-01-0045	PL2C-2124-02-0035	PL2C-2124-03-0018	PL2C-2124-05-0035	PL2C-2124-04-0036
Analyte	**Units**	**PMCL**	**2004 SL**					
VOCs (Detected Constituents only)								
1,2,4-Trimethylbenzene	µg/kg	--	2,360	1.1 U	1.4 U	1.1 U	1.2 U	3.7
1,3,5-Trimethylbenzene	µg/kg	--	2,470	1.1 U	1.4 U	1.1 U	1.2 U	3
2-Butanone	µg/kg	--	--	5.4 U	54	5.4 U	5.7 U	68
Acetone	µg/kg	2.6E+08	--	6.1	260	7.6	8.3	300
Carbon disulfide	µg/kg	--	--	1.1 U	1.4 U	1.1 U	1.2 U	4.3
Methylene chloride	µg/kg	96,000	828	2.2 U	2.7 U	2.2 U	2.3 U	7.9
m,p-Xylene	µg/kg	8,771,000	--	1.1 U	1.4 U	1.1 U	1.2 U	4.2
PCBs								
Total PCBs	µg/kg	33	33	37 U	44 U	35 U	39 U	49 U
Petroleum Hydrocarbons								
TPH - Gasoline Range	mg/kg	100	30	20 U	20 U	20 U	20 U	20 U
TPH - Diesel Range	mg/kg	200	2,000	50 U	50 U	50 U	50 U	50 U
TPH - Motor Oil Range	mg/kg	200	2,000	100 U	100 U	22	100 U	100 U
Creosote (Identfied by HCID)								
Creosols*	mg/kg	--	--	NA	NA	75	NA	NA

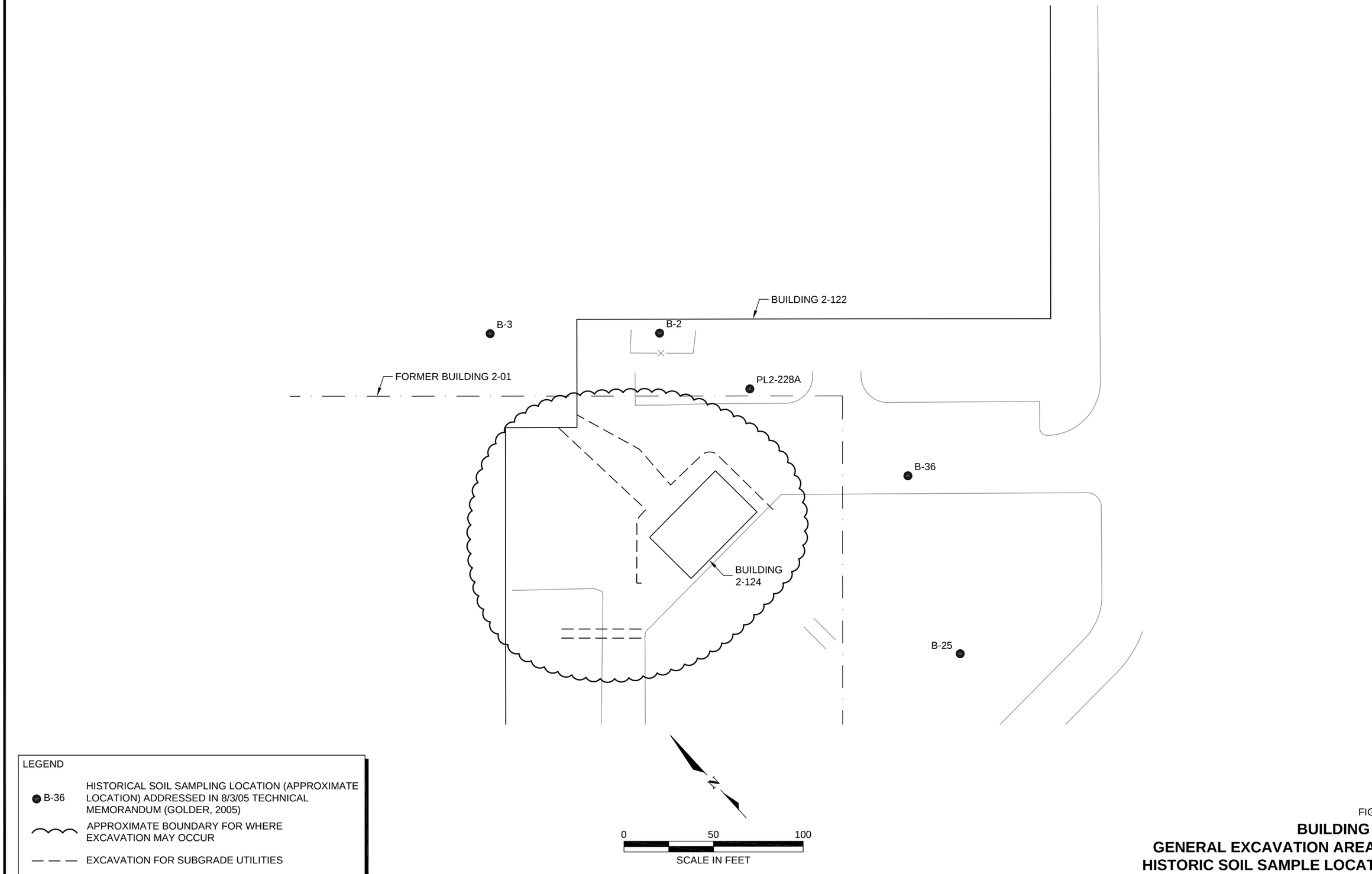
Notes:

-- - No applicable PMCL (Weston, 1999) or 2004 CMS Screening Level

U - Indicates that the target analyte was not detected at the reported concentration.

* The presence of creosols were identified by the NWTPH-HCID analysis. Follow up analysis quantified the concentration. There is no 1999 PMCLs or 2004 SLs for Creosols
For comparison purposes, the MTCA Method B formula value (direct contact pathway) for unrestricted use for p-creosol is 400 mg/kg and 4,000 mg/kg for the m- and o- isomers.

NA - Not applicable or not analyzed



LEGEND

- B-36 — HISTORICAL SOIL SAMPLING LOCATION (APPROXIMATE LOCATION) ADDRESSED IN 8/3/05 TECHNICAL MEMORANDUM (GOLDER, 2005)
- APPROXIMATE BOUNDARY FOR WHERE EXCAVATION MAY OCCUR
- EXCAVATION FOR SUBGRADE UTILITIES

FIGURE **1**

BUILDING 2-124
GENERAL EXCAVATION AREA AND HISTORIC SOIL SAMPLE LOCATIONS
BOEING/PLANT 2 CMS/WA

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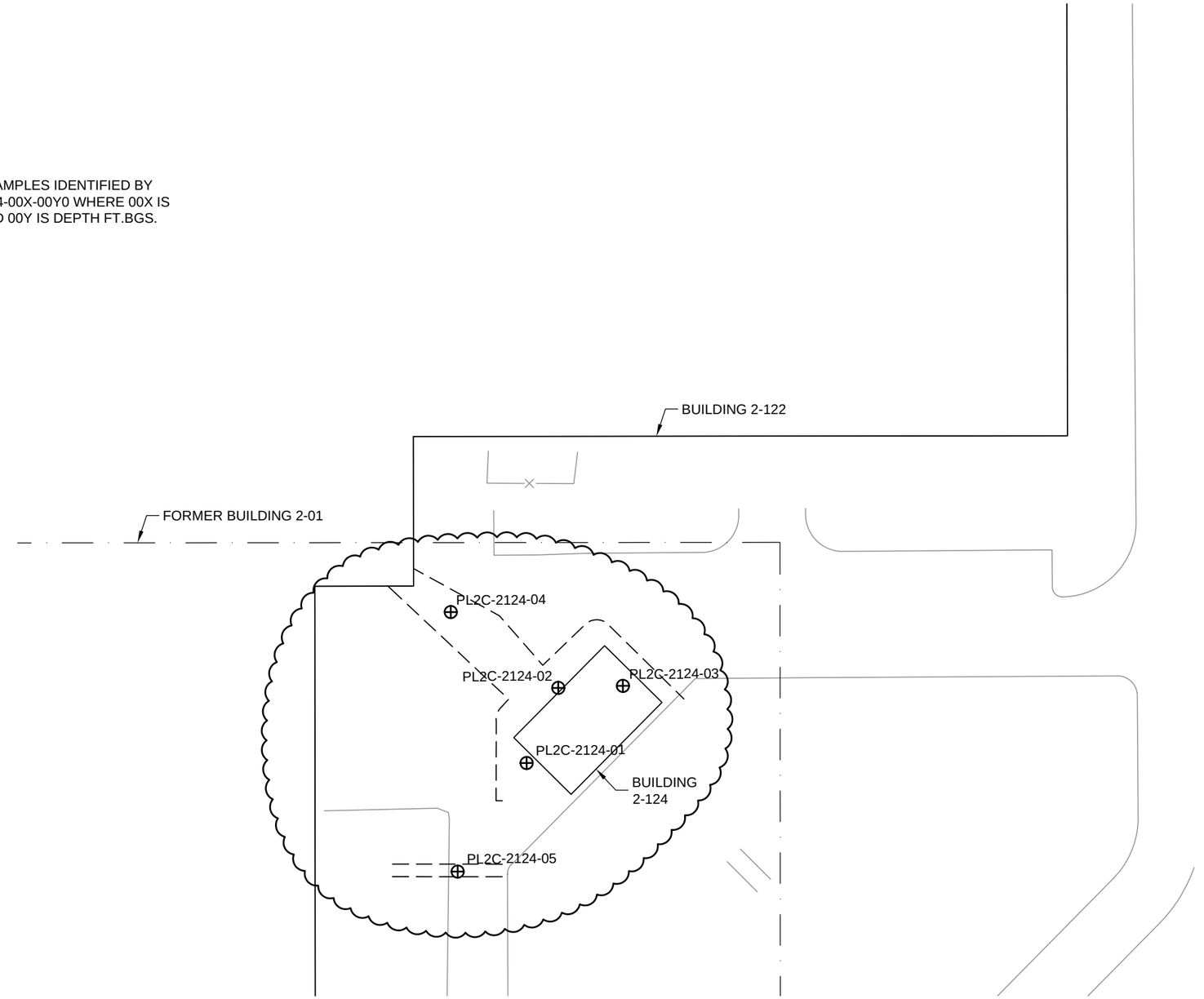
PRE-CONSTRUCTION SAMPLES IDENTIFIED BY LOCATION AS PL2C-2124-00X-00Y0 WHERE 00X IS LOCATION NUMBER AND 00Y IS DEPTH FT.BGS.



LEGEND

PL2C-2124-01 ⊕	PRE-CONSTRUCTION SOIL SAMPLING LOCATION (CONSTRUCTION SUPPORT)
~~	APPROXIMATE BOUNDARY FOR WHERE EXCAVATION MAY OCCUR
— — —	EXCAVATION FOR SUBGRADE UTILITIES

FIGURE **2**

BUILDING 2-124

PRE-CONSTRUCTION SOIL SAMPLE LOCATIONS

BOEING/PLANT 2 CMS/WA

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TECHNICAL MEMORANDUM

TO: **Mike Gleason, Will Ernst (Boeing)** **Date: August 3, 2005**

FR: **David Beede, Kent Angelos (Golder)** **Job No.: 013-1646.001.700**

RE: **Boeing Plant 2, 2-124 Area Excavation Evaluation**

Introduction and Summary

Boeing is planning construction for a new storage building to be identified as *Building 2-124* adjacent to Building 2-122 at Plant 2 (Figure 1). This memorandum presents an evaluation of the soil and groundwater environmental investigation data associated with and in proximity to the planned excavation areas associated with the construction of Building 2-124.

Figure 1 shows the foot print for Building 2-124, proposed areas of excavation, and historical soil and groundwater sample locations. None of the areas proposed for excavation for this project are adjacent to, downgradient, or within the extent of any identified RCRA units at Plant 2. All available and existing groundwater and soil environmental data applicable to this project were evaluated as part of this technical memorandum.

Table 1 displays the detected concentrations of chemicals in soil and groundwater samples in the vicinity of the planned Building 2-124 outline.

Historic concentrations of chemical constituents in soil samples collected in the vicinity were below Preliminary Media Cleanup Levels (PMCLs), with the exception of two samples. The sample at location B-3 at 2.5 feet (ft.) to 9 ft. showed arsenic at 8.8 mg/kg compared with the PMCL of 7.3 mg/kg and the sample at location B-36 at 6 ft. to 8.5 ft. showed cadmium, copper, mercury and zinc at the concentrations in comparison to the PMCLs:

	Sample	PMCL
Cadmium	2.9 mg/kg	1.28 mg/kg
Copper	310 mg/kg	36.4 mg/kg
Mercury	0.2 ug/kg	0.07 mg/kg
Zinc	220 mg/kg	107 mg/kg

Historic concentrations of chemical constituents in groundwater collected at monitoring well PL2-228A were undetected and below PMCLs.

Construction Support Activities

Construction support activiites will include visual inspections of the excavations and field monitoring will be conducted during construction and if warranted. Soil samples will be collected at the locations identified in Figure 2 in accordance with the attached scope of work.

Scope of Work – Boeing Plant 2, Building 2-124 Construction Sampling
Scheduled: August 2005

Introduction. As part of construction of a new storage building (Building 2-124), environmental soil sampling will be conducted at 5 locations (5 samples total) for laboratory analysis. The laboratory analysis are necessary to provide sufficient data for disposition of excavated soils and to support construction health and safety monitoring activities.

Sampling Strategy. Figure 2 provides a map of the construction area and proposed sampling locations.

Constituents of Potential Concern (COCs). Previous investigations in the area (Table 1) have identified metals in soil at concentrations greater than PMCLs. Volatile organic compounds (VOCs) have also been identified at low concentrations and below PMCLs. Groundwater sample analyses (Table 2) have been undetected.

Based on previous investigation results and historical knowledge, sampling will include laboratory analysis of VOCs, metals, polychlorinated biphenyls (PCBs) and petroleum hydrocarbons (TPH). TPH analysis will include an analysis for hydrocarbon identification (HCID) followed by the appropriate analysis for the particular fraction of petroleum hydrocarbon material (diesel, gasoline or motor oil).

Field Activities. Field activities will consist of the following:

- Conducting an inspection of the sampling area. No confined space entry will be conducted in association with the sampling activities. The preliminary inspection will include written description of the condition of the sampling area.
- Prior to the conducting the sampling, a safety briefing will be conducted. The briefing will include a summary of the potential COCs and identify personal protective equipment (PPE). PPE shall consist of steel-toed rubber boots, tyvek coveralls, nitrile gloves, eye and ear protection, and a hardhat.
- Visual inspection and written notation of underlying soils removed from the sampling location will be conducted.
- Samples will be obtained from five locations at depths of 2 ft. to 4 ft. bgs. Samples will be screened for VOCs with a PID at the time of sampling.
- Samples will be collected into glass jars with teflon lined caps as follows:
    - VOCs: two 4 oz jars per sample.
    - Metals, PCBs and TPH: one 8 oz. jar per sample.
- All samples will be identified and labeled using the following numbering scheme:

  PL2CS-2124-0X-00Y0 where,
  0X is the sample location number (to be defined in the field and
  00Y0 is the sampling depth in feet below ground surface (bgs).
- Samples will be chilled to 4ºC and placed in a insulated shipping container for delivery under chain-of-custody to the laboratory (ARI) for analysis.

TABLE 1
BOEING PLANT 2 - BUILDING 2-124 CHEMICALS DETECTED IN SOIL

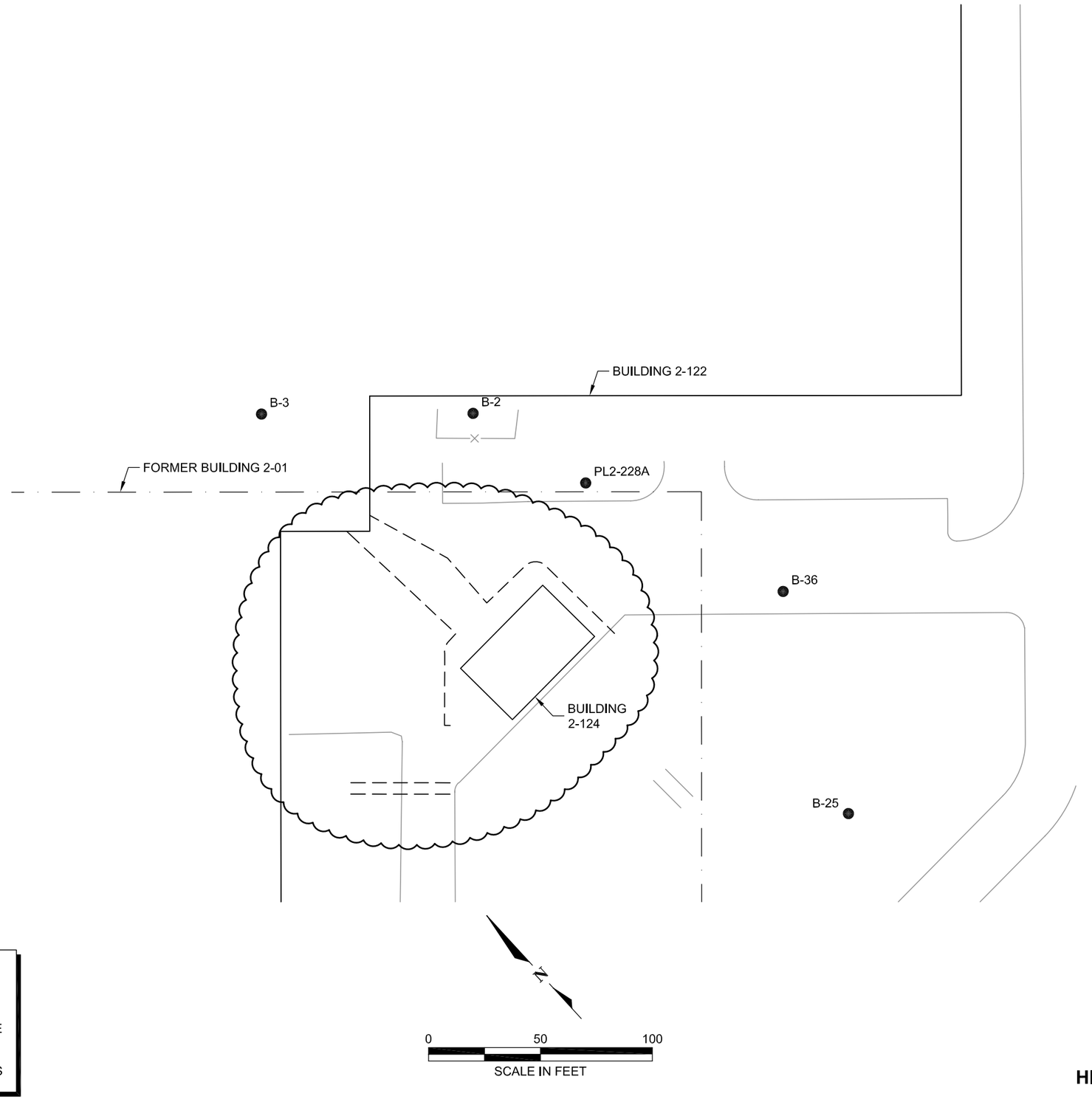
STATION		B-2	B-2	B-2	B-2	B-25	B-25	B-3	B-3	B-36	B-36	B-36	B-36	PL2-228A	PL2-228A
SAMPLE ID		B2A	B2B	B2C1	B2C2	B25C1	B25V1	B3S1	B3S2	B36C1	B36C2	B36V1	B36V2	B1S1	B1S2
INTERVAL		2.5 - 4	5 - 6.5	2.5 - 6.5	7.5 - 14	2.5 - 11.5	2.5 - 4	2.5 - 9	7.5 - 9	0.5 - 5	6 - 8.5	2.5 - 3	6 - 6.5	2.5 - 4	15 - 16.5
SAMPLE DATE		4/30/1990	4/30/1990	4/30/1990	4/30/1990	8/16/1990	8/16/1990	5/4/1990	5/4/1990	8/23/1990	8/23/1990	8/23/1990	8/23/1990	5/4/1990	5/4/1990
Metals	**PMCLs [a]**														
Arsenic (mg/kg)	7.3			4.8 J		3.2		8.8 J		3.3	3.8			6.1 J	
Cadmium (mg/kg)	1.28			0.5		0.5 U		0.2		0.5 U	2.9			0.2 U	
Chromium (mg/kg)	1000			12		14		14.6		13	17			11.8	
Copper (mg/kg)	36.4			13.2		12		18.2		13	310			14.2	
Lead (mg/kg)	400			3 U		10 U		11		18	160			3 U	
Mercury (mg/kg)	0.07					0.1 U				0.1 U	0.2				
Nickel (mg/kg)	38.2			9				11						10	
Zinc (mg/kg)	107			23.6		34		61.8		40	220			23.1	
Volatile Organic Compounds (VOCs)															
Tetrachloroethene (µg/kg)	890	1.2 U	1.4 U				2 U	1.4	1.4 U			2 U	2 U	1.5	1.3 U
Toluene (µg/kg)	500000	1.5	1.4 U				2 U	4.7	1.4 U			2 U	2 U	6.8	0.7 J
Xylenes (total) (µg/kg)	8771200	1.2 U	1.4 U				2 U	0.8 MJ	1.4 U			2 U	2 U	1.3 J	1.3 U

Notes:

a - Preliminary media cleanup levels (PMCLs). PMCL values are consistent with the values listed in Technical Memorandum Appropriateness Evaluation Corrective Study Boeing Plant 2 March 1999, Appendix B (Weston, 1999).
Shading indicates that the constituent was detected at or above its PMCL

BOEING PLANT 2 - BUILDING 2-124 GROUNDWATER SAMPLE RESULTS

STATION		PL2-228A
SAMPLE ID		W04-MW-AL-01
SAMPLE DATE		5/8/1990
Cyanide and Metals	**PMCLs [a]**	
Arsenic - Total (µg/L)	3	1 U
Cadmium - Total (µg/L)	9.3	2 U
Chromium - Total (µg/L)	50	5 U
Copper - Total (µg/L)	2.9	2 U
Lead - Total (µg/L)	5.6	30 U
Nickel - Total (µg/L)	8.3	10 U
Zinc - Total (µg/L)	86	4 U
Volatile Organic Compounds (VOCs)		
1,1,1-Trichloroethane		1 U
1,1,2,2-Tetrachloroethane		1 U
1,1,2-Trichloroethane		1 U
1,1,2-Trichlorotrifluoroethane		1 U
1,1-Dichloroethane		1 U
1,1-Dichloroethene		1 U
1,2-Dichloroethane		1 U
1,2-Dichloropropane		1 U
2-Butanone		2.5 U
2-Chloroethylvinylether		1 U
2-Hexanone		5 U
Acetone	2,552,858	5 U
Benzene	43	1 U
Bromodichloromethane		1 U
Bromoform		1 U
Bromomethane		1 U
Carbon disulfide		1 U
Carbon tetrachloride		1 U
Chlorobenzene		1 U
Chloroethane		2 U
Chloroform		1 U
Chloromethane		1 U
cis-1,2-Dichloroethene	16,204	1 U
cis-1,3-Dichloropropene		1 U
Dibromochloromethane		1 U
Ethylbenzene		1 U
Methyl isobutyl ketone		7.5 U
Methylene Chloride	960	0.6 UJB
Styrene		1 U
Tetrachloroethene		1 U
Toluene	5000	1 U
trans-1,2-Dichloroethene		1 U
trans-1,3-Dichloropropene		1 U
Trichloroethene	55	1 U
Trichlorofluoromethane		1 U
Vinyl Acetate		1 U
Vinyl Chloride	2.9	1 U
Xylenes (total)	87,712	1 U



LEGEND

- B-36 — SOIL BORING DESIGNATION AND APPROXIMATE LOCATION
- APPROXIMATE BOUNDARY FOR WHERE EXCAVATION MAY OCCUR
- EXCAVATION FOR SUBGRADE UTILITIES

FIGURE **1**

BUILDING 2-124
HISTORIC SOIL SAMPLE LOCATIONS

BOEING/PLANT 2 CMS/WA

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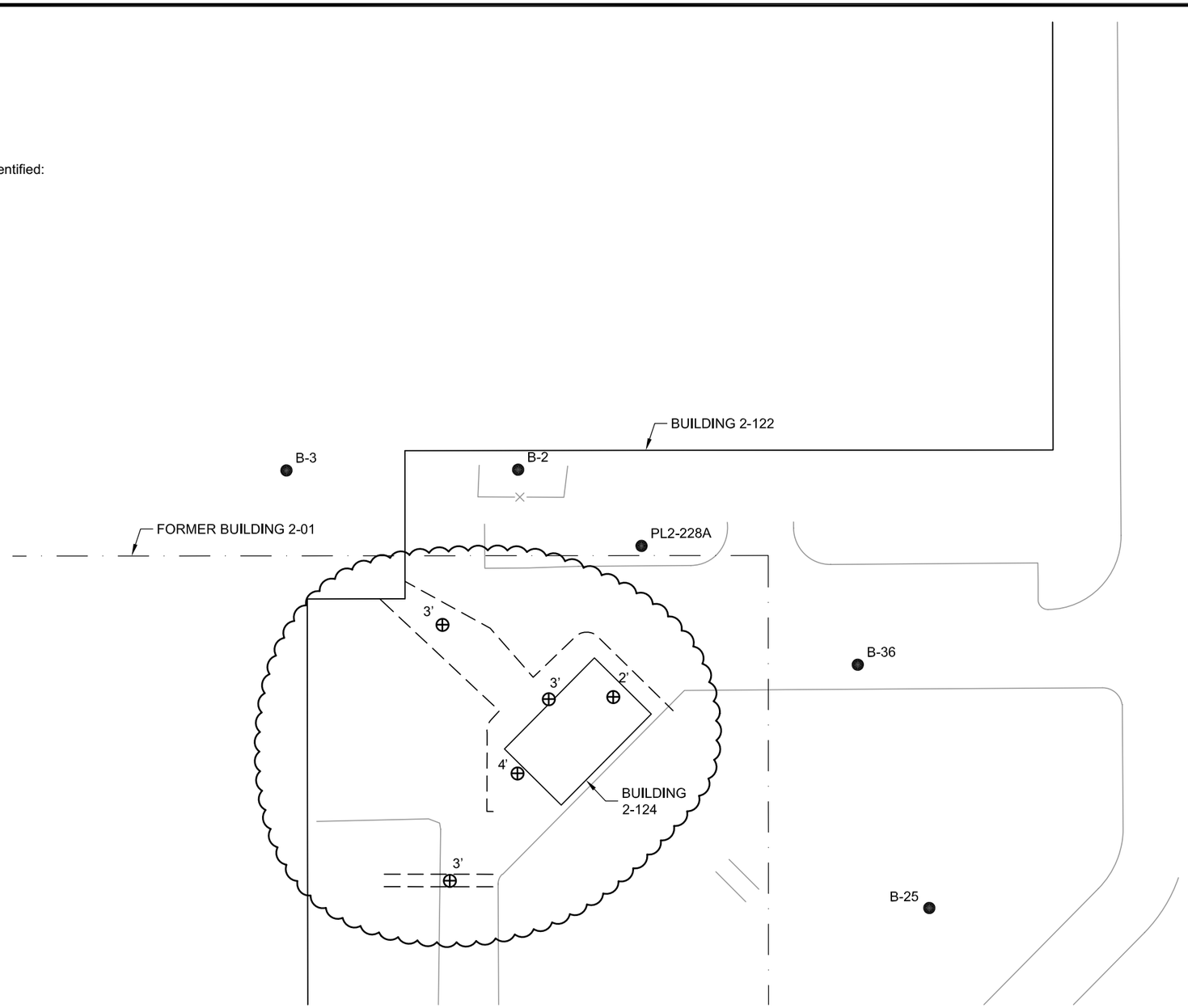
Construction sample locations to be identified:

PL2CS-2124-00X-00Y0 where,
00X is location number and
00Y0 is depth in ft., Bgs



LEGEND

- ⊕ PLANNED SOIL SAMPLING LOCATION (CONSTRUCTION SUPPORT)
- ● B-36 HISTORICAL SOIL SAMPLING LOCATION (APPROXIMATE LOCATION)
- APPROXIMATE BOUNDARY FOR WHERE EXCAVATION MAY OCCUR
- — — — EXCAVATION FOR SUBGRADE UTILITIES

FIGURE **2**

BUILDING 2-124
PLANNED SOIL SAMPLE LOCATIONS
BOEING/PLANT 2 CMS/WA

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